Cumella vulgaris

Phylum: Arthropoda, Crustacea
Class: Malacostraca
Order: Cumacea
Family: Nannastacidae

Description

Size: In the original description by Hart (1930) from Vancouver Island, an ovigerous female was 2.5 mm in length and a male, 3.0 mm long (Hart 1930). The illustrated specimens (from Coos Bay) include a female, 2.5 mm long, and a young male, 2.1 mm in length. *Cumella vulgaris* is one of the smallest cumacean species (Sars 1900).

Color: Males are dark brown except for lighter distal segments and appendages. The female carapace and sixth pleonite are dark brown and the rest of the body is light brown or white (Gonor et al. 1979).

General Morphology: Cumaceans are easily recognizable by a large and inflated carapace and a (relatively) slender, flexible thorax and abdomen (Kozloff 1993; Gerken and Martin 2014) (Fig. 1). Their bodies can be divided into these three major regions: the **cephalon** (head) that is covered by a **carapace** and includes the first five pairs of appendages (antennae, mandibles, maxillae, collectively the **mouthparts**). Posterior to the cephalon is the **pereon** (thorax), usually consisting of five thoracic somites, followed by the **pleon** (abdomen) with consistently six pleonites. The fifth pleonite is usually the longest and the pleonites are lacking **pleopods** in female individuals. The cumacean family Nannastacidae are characterized by the lack of a free telsons and uropod endopods that are uniarticulate (Watling 2007). (For general morphology of *C. vulgaris*, see also Plate 229B, Watling 2007.)

Cephalon: A carapace covers the cephalon and first three thoracic somites and is expanded on either side to form a branchial chamber (Watling 2007).

Carapace: Female carapace is large and deep, with a smooth mid-dorsal carina (ridge) with a depression on each side (on posterior margin). A deep antennal notch is present, with an acute antero-lateral angle (Fig. 1). The male carapace is slender, the antennal notch is not as deep as in females, and the dorsal carina is almost absent (Fig. 3).

Rostrum: Two pseudorostral lobes (together called a pseudorostrum), or extensions of the carapace, extend anteriorly but do not fuse in front of the head in cumaceans (Watling 2007). The pseudorostrum in female *C. vulgaris* is relatively short, minutely serrate anteriorly and strongly pronounced (Fig. 1). In males, the pseudorostral projection is shorter (Sars 1900) (Fig. 3).

Eyes: Conspicuous and circular in females (Gonor et al. 1979) (Fig. 1). In males a single central sessile eye, with seven equal lenses, is more prominent (Gonor et al. 1979) (Fig. 4).

Antennae: Female antennule is rather stout, not easily visible, and with rudimentary inner flagellum (Nannastacidae, Fage 1951). The second antenna in females is with two large plumose setae (Hart 1930) (not figured).

Mouthparts: Mandibles are not unique and the bases are not massive (Fage 1951) (not figured).

Pereon: Consists of five thoracic somites, each with paired appendages (**pereopods**) (Figs. 1–3).

Pereopods: The first pereopods in females are with bases serrate on the outer distal margin. The dactyl and propodus are equal to the carpus in length. The second pereopods are stout, and the dactyl is twice as long as the propodus. The exopodites are present on the first two pairs of pereopods only (*Cumella,* Lie 1969). The last three pereopods are stout (Fig. 1). The first four pereopod bases in males are more dilated than in females and exopodites are present

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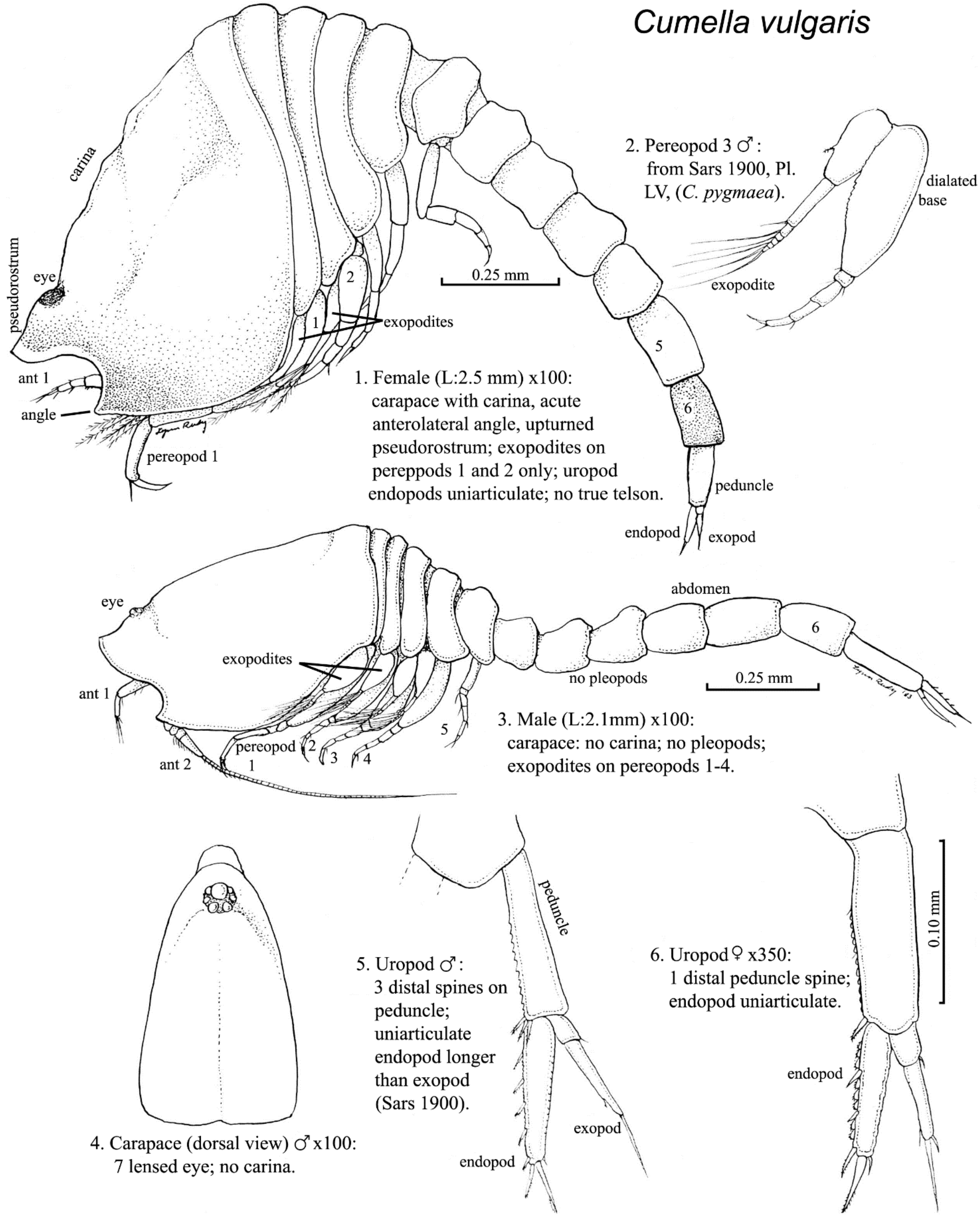
Cumella vulgaris



1. Female (L:2.5 mm) x100: carapace with carina, acute anterolateral angle, upturned pseudorostrum; exopodites on pereppods 1 and 2 only; uropod endopods uniarticulate; no true telson.

2. Pereopod 3 ♂: from Sars 1900, Pl. LV, (*C. pygmaea*).

3. Male (L:2.1mm) x100: carapace: no carina; no pleopods; exopodites on pereopods 1-4.

4. Carapace (dorsal view) ♂ x100: 7 lensed eye; no carina.

5. Uropod ♂: 3 distal spines on peduncle; uniarticulate endopod longer than exopod (Sars 1900).

6. Uropod ♀ x350: 1 distal peduncle spine; endopod uniarticulate.

on the first four pereopods (absent on fifth) (Figs. 2, 3).

Pleon: Long and narrow in males and stouter in females. Consists of six articles or pleonites, and lacking pleopods (Figs. 1, 3).

Pleopods: All female cumaceans lack pleopods (Fig.1) and males in the family Nannastacidae also lack pleopods (Watling 2007) (Fig. 3).

Telson: Telson short, not freely articulated and fused to sixth abdominal article (Nannastacidae, Watling 2007) (Figs. 1, 3).

Uropods: The uropod peduncles in females have inner margin with only one spine on the inner distal angle (Gonor et al. 1979) (Fig. 6). The uropod endopod is uniarticulate (compare to biarticulate endopod in *Nippoleucon hinumensis*), larger than exopod, denticulate on inner margin, with two stout spines, and one strong apical spine. The exopod is with two articles (as in all cumaceans), is ½ the width of the endopod, and with one slender apical spine (Fig. 6) (Gonor et al. 1979). The uropods of males are slim and the peduncle is denticulate, longer than rami (Fage 1951), and with three distal spines. The endopod is with only a single article (Nannastacidae, Watling 1979), while the exopod is with two articles (Fig. 5).

Sexual Dimorphism: Quite strong sexual dimorphism is observed in *C. vulgaris*. Females are generally shorter and stouter than males and mature individuals have a brood pouch. The female eye lacks the obvious large lenses found in males (Fig. 4). Female specimens have a broader carapace and uropods, a strong carapace carina, and exopodites that appear only on the first two pairs of pereopods. Males have a compound eye, are slim, lack a strong carapace carina and have a very long second antenna. Males also have four pereopod exopodites and some uropod distinctions.

Possible Misidentifications

Cumaceans are very small (range 1 mm–1 cm) shrimp-like crustaceans. Their heads and thorax are fused to form a carapace, the abdomen is tubular and the uropods are slender and biramous. There are 1500 species worldwide, approximately 50 of which occur on the Pacific coast of the United States (Watling 2007; Gerken and Martin 2014). Cumaceans belong to the Malacostraca, and are characterized by a carapace that covers the first three or four thoracic somites. They also have an anterior extension (pseudolobes), a telson that is present or reduced and fused with the last pleonite, eyes that are united dorsally, a second antenna that is without an exopod and pleopods that are absent in females and can be absent or reduced in males (Watling 2007).

The superorder Peracarida includes cumaceans, mysids, isopods, tanaids and amphipods. Cumaceans can be separated from mysids by their single compound eye (particularly in the males), as mysids have large stalked eyes. Mysids have a carapace which covers the entire thorax, while cumaceans have several posterior segments exposed (e.g. Figs. 1, 3). Euphausiids belong to the superorder Eucarida (along with decapods) and are pelagic and marine, but might occasionally be found in estuaries. They have biramous thoracic appendages (cumacean pereopods are uniramous, with some thoracic exopodites). Additionally, euphausiids have strong pleopods for swimming and cumacean pleopods, when present, are small.

The four local cumacean families can be divided into those with a freely articulated telson and those without, the former comprise the Lampropidae and Diastylidae, while the latter comprise the Leuconidae and Nannastacidae (Watling 2007). Cumacean families that lack an articulated telson are consistently monophyletic on molecular phylogenies and are likely derived within the Cumacea (Haye et al. 2004). However, morphological characters used to differentiate cumacean families (e.g. number of pleopods in males) may be homoplasious (see Haye et al. 2004).

The family Nannastacidae, in which *Cumella* occurs, lack an independent telson, the males have no pleopods and the endopod of the uropod is uniarticulate. Pereopodal exopodites in the Nannastacidae are as follows: males have five (rarely four or three) pairs and females have three (rarely four or zero) pairs (Watling 1979). *Cumella vulgaris* is the only species in this genus locally. However, *C. pygmaea*, the European species is very like *C. vulgaris* in color and size. The female of *C. pygmaea* is stouter than *C. vulgaris,* with a less inflated carapace and with a dentate crest on the carina. The male of *C. pygmaea* is similar to that of *C. vulgaris,* except that its pedigerous segments are more uneven (Hart 1930). The only other genus of Nannastacidae from our area is *Campylaspis*. In this genus, both males and females have exopodites only on the first pair of pereopods (Lie 1969). The females have a bulbous carapace with rounded anterolateral angles, unlike *Cumella*, which has an un-inflated carapace and an acute anterolateral angles. *Campylaspis* species have a carapace that extends posteriorly and overhangs the first few pereonites. *Campylaspis canaliculata* has a smooth carapace and females with a marginal anterior-posterior groove. *Campylaspis hartae* has a carapace with large ridges, but no bumps, and *C. rubromaculata* has a carapace with a series of bumps or tubercles and shallow ridges (Watling 2007).

The Leuconidae (like the Nannastacidae) lack an independent telson. However, they always have a biarticulate uropod endopod, not a uniramous one as in Nannastacidae. Members of the Leuconidae often have up to two pairs of male pleopods (there are none in Nannastacidae) and leuconid males have exopodites on all five pairs of pereopods (rarely on three). Leuconid females have exopodites on four (rarely on three) pairs of pereopods (Watling 1979). Thus, numbers of pereopodal exopodites in both sexes are too alike in the families Leuconidae and Nannastacidae to serve as dependable determining characters. Of the Leuconidae, the genera *Eudorella*, and *Nippoleucon* (see *N. hinumensis*, this guide) occur on the Pacific Coast (each with one local species).

The Lampropidae and Diastylidae have a freely articulated telsons and the former family has three or more terminal setae on the telson while the latter has 0–2. The Lampropidae includes six local species in the genera *Hemilamprops* and *Mesolamprops* (each with one local species) and the *Lamprops* (four local species, see *L. quadriplicata,* this guide). In the Diastylidae there are five local species in three genera including *Anchicolurus* and *Diastylopsis* (one local species each) and *Diastylis* (three local species) (Watling 2007).

Ecological Information

Range: Type locality is Puget Sound (Hart 1930), known range from central California to Oregon (Watling 2007).

Local Distribution: Known in occur in Coos and Yaquina bays.

Habitat: Cumacean species choose substrates mostly based on food availability. *Cumella vulgaris* prefers fine sand (grains with diameter less than 160 µm*)* and dislikes dry sand (in lab experiments). Males can be found in sand with grains of 200 µm diameter and smaller (Wieser 1956) and are also found on the water surface, near shore (Hart 1930). *Cumella vulgaris* actively avoids habitats with fast currents (McCauley et al. 1977). Applications of the insecticide Sevin caused significant decreases (90%) in *C. vulgaris* abundance (Simenstad and Cordell 1989).

Salinity: Collected at salinities of 30 (in Coos Bay).

Temperature:

Tidal Level: Intertidal and usually found below +1.5 meters MLLW down to -0.6 meters Wieser 1956). Individuals found on water surface and in standing water at low tide (Hart 1930). Subtidal populations are reported as deep as 10 m (Jones 1961).

Associates:

Abundance: The most common cumacean in Puget Sound and San Juan Islands, Washington (Wieser 1956) and a common intertidal species in central California. In Coos Bay, it was the second most abundant crustacean (by numbers) found in a North Bend study site (Gonor et al. 1979). With *Nippoleucon hinumensis*, it was found at up to 5,600 individuals per square meter in South Slough of Coos Bay (personal communication, M. Posey, OIMB). In Willapa Bay, *C. vulgaris* was the third most abundant organism in *Neotrypaea* beds, ninth most abundant in *Zostera* beds, seventh most abundant in oyster beds and twelfth most abundant in bare mud and sand (Ferraro and Cole 2007).

Life-History Information

Reproduction: Development in cumaceans is direct, where eggs hatch within a marsupium, and development is thought to be similar among cumacean genera (e.g. *Leucon*, *Lamprops* and *Pseudocuma,* Gerken and Martin 2014). Little is known about the development of *C. vulgaris*, specifically. In *Manocuma stellifera,* an Atlantic intertidal cumacean, mating occurs at night in plankton (Gnewuch and Croker 1973; Watling 1979), during the short swarming period. Females molt 12–96 hours before oviposition (in the lab). Eggs are probably fertilized as they are released into the marsupium, where they are carried to a manca stage. Some other intertidal species have two breeding generations per year, one in summer and in fall (see Corey 1969, 1976 in Watling 1979).
Larva: Cumacean development proceeds from an egg to two manca stages, a subadult and, finally, an adult. The manca stage resembles the adult, but is defined by a lack of the fifth pair of pleopods (see Fig. 41.1F, Gerken and Martin 2014). The mancae of *M. stellifera* molt three times and the young leave the marsupium, molt several more times into subadult morphology, with mature gonads and secondary sexual characteristics present (see Corey 1969, 1976 in Watling 1979).
Juvenile:
Longevity: In Atlantic intertidal cumaceans, longevity varies with reproductive time of year: an early summer generation may live five months, while late summer and fall broods will overwinter and live 12 and nine months, respectively (see Corey in Watling 1979).
Growth Rate:
Cumacean growth occurs in conjunction with molting where the exoskeleton is shed and replaced. Post-molt individuals will have soft shells as the cuticle gradually hardens. During a molt, arthropods have the ability to regenerate limbs that were previously autotomized (Kuris et al. 2007).
Food: A deposit feeder in fine sand and mud. In coarse sand (>150 µm), it is an epistrate feeder that scrapes food off individual grains (Watling 1979; Kozloff 1993). Cumaceans feed while buried and swim to new site when one site has been exploited. *Cumella vulgaris* aggregates to feed (Watling 1979).
Predators: *Cumella vulgaris* have been observed in gut contents of the three-spined sticklebacks (*Gasterosteus aculeatus)* and Northern anchovies (*Engraulis mordax)* (Rasmuson and Morgan 2013). The introduced European green crab (*Carcinus maenas)* significantly reduced *C. vulgaris* populations (Grosholz and Ruiz 1995). Shorebirds feed on *C. vulgaris,* but have no notable impact on abundance (Wilson 1991).
Behavior: Females and juveniles are capable of swimming at speeds of 0.25 to 1.5 cm per second, while males are capable of higher swimming speeds (~5 cm s^{-1}, King 1977).

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